

THE PSYCHOLOGICAL BULLETIN

THE SELF IN RECENT PSYCHOLOGY*

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I

i. Since the publication, fifteen years ago, of the first paper under this title, the self, then under grave suspicion among orthodox scientists, has become a fairly respectable member of psychological society. It has played a significant rôle not merely in general normal psychology but also in the so-called "new psychology," which deals with dissociation, repression, and conflict, and has figured, finally, in experimental studies, notably in investigations of problem-solving and of choice. Excepting, however, for a few incidental references, this paper deliberately, though regretfully, neglects the complicated yet rewarding topic of the self in abnormal psychology.

To start from the self in general psychology, Ruckmick (31), in his discussion of the "Schematic Classification of General Psychology," brackets self-psychology with structural, functional and dynamic psychology under the heading, "empirical theoretical psychology"; J. S. Moore (27) treats self-psychology as coördinate with structuralism, functionalism, and behaviorism; Roback (30) devotes to the exposition and criticism of self-psychology the greater part of his discussion of the question, "How is psychology to be defined?" And English (17) includes self-psychology with "content-psychology," "functionalism," "hormic psychology," behaviorism, and *Gestalt-psychologie* in making up the group of systems which,

*For earlier summaries under this title, cf. this journal, January, 1912, January, 1916, April, 1919.

he believes, are synthesized by his proposed "personalistic act-psychology." †

The years under review of course offer, besides these attempts to classify self-psychology, many more specialized discussions. More than one writer, for instance (5, 28), has stressed the likeness of the self-psychologist's self, the integrated individual, enduring and yet capable of growth, to the behaviorist's integrated organism. Stern (35) has contrasted the "ego-reflexive" attitude of the youth with the merely "ego-centric" attitude of the child. Claparède (14), in a detailed account of the visual "localisation" of his "*moi*" in the center of his head, carefully distinguishes the subject's from the psychologist's self; and, in the end, reaches the conclusion that *moi connoisseur* and *moi connu* are identical.

If one turn from journal articles to books, one finds the self-psychology of the period greatly enriched by William Stern and by William McDougall. In the "Outline of Psychology" (24), McDougall unequivocally affirms the basal position of a personalistic psychology. "All experiencing is," he says, "the experiencing or thinking of *some one*, some subject, some person, some organism" (p. 40), and with equal vigor he opposes the alternative doctrine of what he calls the mosaic psychology (p. 16) by challenging the student to "ask himself whether he has ever chanced to find 'a percept' or 'a concept' or 'an idea' or 'a sensation' lying about loose in the world. . . . He will realize," McDougall says, "that he has never done so nor is likely to do so. He might as well expect to find 'a falling' or 'a movement' without something that falls or moves as 'a perceiving' or 'a remembering' detached or isolated from the subject who perceives or remembers" (p. 40). The *Outline of Abnormal Psychology* (25) implies or avows the same conception of self. McDougall uses, for example, the phrase "dissociation of the personality" in place of the words "dissociation of consciousness" on the ground that the latter involves "the questionable assumption that consciousness is an aggregation, that the stream of normal thinking is, somehow, compounded of elements of consciousness capable of independent . . . existence; in short, it assumes the truth of some form of the atomistic psychology" (p. 234). (It should be added, by way of criticism, that in the view of the writer

† By the adjective "personalistic," and by more than one specific statement, English tempts the reader to interpret his conception as a form of self-psychology.

of this paper (7) McDougall tends, in the statement of his theory of character as integration of sentiments, to treat the sentiments atomistically. His dominating sentiment of self-regard (pp. 526 *et al.*) usurps the place which should belong to the will assertive self.)

Stern treats psychology as the study of the individual man. His "person" is closely parallel to McDougall's "mind," or "subject." "Psychic acts," he says, belong to this or that person . . . ; the person is the real performer of them" (34, p. 123). More successfully than McDougall, Stern grounds his psychological descriptions and classifications in the basal characters and relations of the self. As fundamental facts of consciousness, he rates the basal purposes, self-preservation and self-expression, and the dispositions of the self (pp. 68 ff.); as forms of the relation of self to the world, he distinguishes inheritance from reaction to environment (pp. 104 ff.); as characteristic types of experience, he contrasts the forms of objective consciousness (*das Objectbewusstsein*), perceiving, imagining, and thinking, from those of subjective consciousness, impulse, emotion, and volition (pp. 229 f.).

Another, though an incidental, supporter of self-psychology is one of the *Gestalt* psychologists, Koffka. In a paper contributed to the *British Journal of Psychology* (19), Koffka declares that *Gestalt-psychologie* studies the reactions of "the organism in its environment"; and that among these reactions must be reckoned "those which are usually termed consciousness" (p. 153). Obviously the self, or person, is at the very least the supreme example of a *Gestalt*, an integrated whole not made up of mental items but expressing itself in them. Such a conception of the self, as "experiencing individual" is expressly used by Koffka in his "Growth of the Mind" (p. 16).

All three of these writers, Koffka, Stern, and McDougall, represent, it must be noted, what may be called a biological form of personalistic psychology. For them, the basal unit of psychology is not the mind or self which has a body, but the mind-body, the psychosoma, the organism which includes consciousness among its reactions to environment. The writer of this paper has elsewhere argued, in divergence from this view, for the more strictly psychological form of self-psychology. She none the less believes firmly that the differences which divide her narrower type of self-psychology from that of McDougall and of Stern are of little consequence as compared with the significant doctrine which affiliates them in their opposition to behaviorism and to atomism.

ii. Most recent criticisms of self-psychology are more or less effective restatements of old difficulties. J. S. Moore (27), Robert MacDougall (22), and Roback (30) unite in urging that the self, as metaphysical concept or else value, has no part nor lot with the natural science, psychology. "The leading objection," Moore says, "to self-psychology is that it is a metaphysical rather than a scientific psychology" (27, p. 74). "To speak of a permanent self," Roback asserts, "is to commit oneself to a purely idealistic conception of psychology," but every science ought to be able to steer clear of a metaphysical controversy" (30, p. 264). The psychologist, in Robert MacDougall's view, "describes" (and must not appreciate) objects, whereas a study of self is "the study of reality . . . in its values, as material and condition of self-realization" (22, p. 410). The writers just quoted also revive a second criticism of self-psychology—the emptiness and insignificance of the doctrine. "The barren reassertion," MacDougall says, "that in each fact is the self adds nothing to its treatment" (*op. cit.*, p. 186²); and somewhat similarly Roback observes that "were we to adopt" self-psychology "we should be giving up a great deal for very little return" (p. 264²).

To these criticisms self-psychology has often made reply. In opposition to MacDougall's view that the reference to self in psychological descriptions is a "barren reassertion," the writer of this paper has insisted that certain experiences—recognition, emotional sympathy, and pride, for example—are obviously indescribable without specific reference to the consciousness of selves—one's own self and one's fellows (10, p. 541). In deprecation of the charge that the concept of self is metaphysical, she has pointed out that all the critics, in their unguarded moments and paragraphs, imply a self. Moore, in particular, she has argued (8), attributes to his "Subconscious" precisely the persistence which is a basal character of every self.

It may be noted in passing that Moore's criticism might effectively be directed against Dunlap's I, or Ego (16). For though Dunlap says explicitly that "the I or Ego which is conscious" is "a factor . . . to be taken into account" (pp. 23 f.), he also asserts unequivocally that this I, or ego, is "nothing but that which is aware of something" and never itself "an object or content." Apparently, therefore, Prince (29) is unjustified in reckoning Dunlap among the self-psychologists (p. 224). Even more unambiguously this criticism, urged by Moore, Roback, and McDougall, might be launched against Driesch's "unconscious soul" and "determining

tendencies" (15) and against Broad's bizarre and wholly speculative "compound theory" (4, p. 353) of mind as made up of a "psychic" and a "bodily factor . . . just as a salt is a compound of substances neither of which by itself has the characteristic properties of salt" (pp. 335 ff.). In curious contrast with this doctrine is that of another realistic philosopher, Laird (21), who tranquilly confronts his objects of knowledge with minds and who says explicitly: "Minds are substances simply because desiring, willing, and knowing do not float about loosely. They always unite in a personality" (p. 173).

II

The second and longer section of this paper will concern itself with experimentally controlled studies of the self and of its alleged characters and attitudes. (i) First to be considered is a paper published in 1920 in which Raymond Wheeler summarizes an "experimental investigation of the process of choosing." Effectively modifying the method of Michotte and Prüm (37), Wheeler presented for choice two pictures or two titles of familiar Victrola selections. On the reports of his introspectors, whose imagery invariably included kinesthetic factors, Wheeler bases the conclusions that volition consists entirely in kinesthetic sensations, either centrally or peripherally excited, and that volition is not, therefore, rightly conceived as self-activity. The present writer (6, 9) has subjected the recorded introspections to a close study and urges against Wheeler's conclusion, first, the frequent indications that these volitions include self-activity as well as kinesthetic sensation; and second, the suggestion (p. 370¹) that Wheeler failed to find in volition any traces of an assertive self largely because he was looking, not for the concrete and highly complex psychologist's self, but for that pure fiction, the "elemental" consciousness of self as "isolated mental content."

ii. A similar criticism must be made on the most recent of these experimentally controlled investigations, that of Dr. Elizabeth Amen (1). Miss Amen's study was, she says, "undertaken with the purpose of discovering whether there is an immediate, unanalyzable experience of self in Miss Calkins's sense of the term 'self'" (p. 14). In three groups of experiments Miss Amen's subjects recorded their introspections both (1) of choosing between two conventional designs the one "which you would like to have shown to you a second time for the purpose of describing it" and (2) of recognizing the chosen design when a second time displayed. In three other groups, the introspections included in "the choice experi-

ment as already outlined" were followed by introspections of the experience involved in mentally solving problems (pp. 41 ff.). The problems were selected by the experimenter from the standard tests and from miscellaneous sources. In all save the first two groups, the question was asked, "Were you conscious of yourself during these experiences? When? Describe the experience" (p. 25); and the introspections were later guided by the further direction to introspect "with special reference to the occurrence of the self-experience."

As outcome of the study of her subjects' introspective reports, Miss Amen finds, "especially in situations which involve the social factor," . . . that certain introspecters often report "an immediate experience of self, analyzable into meaning, imaginal, and sensory components which are, however, integrated in concrete experience in a unitary, existential whole" (p. 72). But Miss Amen seriously doubts whether this self-experience, reported by her observers, is identical with the consciousness of self "in Miss Calkins's sense. . . . The descriptive terms used by Miss Calkins in her characterization of the self . . . are not," she says, "the terms in which the observers in this experiment have characterized the self-experience. The experience is throughout this dissertation consistently described in terms of a meaning-sensory-imaginal complex of the perceptual order or type" (p. 72¹).

On these conclusions certain comments insistently suggest themselves. The first is this: that Miss Amen's observers were hindered by instruction from the discovery of Miss Calkins's type of self; since they were taught to conceive her "self-consciousness" not only as "immediate" but also as "unanalyzable" experience; whereas Miss Calkins, like all self-psychologists known to her, conceive the self as complex though unique being. Dr. Amen's confusion is the more surprising in that she herself quotes from Miss Calkins several unequivocal statements to the effect that "the self, though indefinable, is not on this account elemental" (p. 10). In spite of this misconception, the introspections of Miss Amen's subjects seem to the writer to be full to overflowing of references to a self-experience of precisely the type which Miss Amen questions. One observer, for instance, was aware that "'I' did the feeling, the comparing and the recognizing" (p. 32); another "was somehow vaguely conscious of myself all during the act of choice—in the sense of self-effort—that it was I who was making the choice" (p. 27); and a third writes, "When I say that such and such an experience involves self-reference

I mean that the experience" is not that of "Tom Smith but of the individual who I am" (p. 53). And these are merely typical reports of introspection which could many times be multiplied.

Miss Amen's positive conception of "meaning as . . . essential factor in the experience described as experience of self" (p. 36) suffers most of all from her utter failure to define or precisely to delimit this most ambiguous of terms.* Two further criticisms must be made upon the doctrine. It suggests, in the first place, a conception of self, as "inter-related system of experiences" (p. 1), which Miss Amen has expressly disavowed. It is, in the second place, with difficulty squared with the introspections of Miss Amen's subjects. These contain only a third as many references (roughly) to "meaning" as to "self." In some of these cases "meaning" seems to be used as bare, unanalyzed, synonym of self-awareness, as in the statement: "There gradually arose an attitude toward R which . . . resolved itself into the meaning 'I may as well select this one as any.'" In other cases, meaning is indeed clearly distinguished from self-experience but the observer, far from reducing the self-feeling to the meaning seems to find both present to his introspection. An example is M's report: "March 5. Right-hand one appealed because meaning of dots on left hand was 'spotted plague' and this meaning created a kinesthetic upset. Self-reference, slightly, in getting the meaning and referring it to 'me' present in consciousness at that moment" (p. 43²).

iii. In opposition alike to Amen and to Wheeler, and in express agreement with Calkins, Aveling (2, 3) believes that the self, "an immediate object of consciousness" (2, 16²), is found through experimentally controlled investigation. By way of additional evidence he offers brief reports of two investigations of his own, one of them closely following the method of Ach, the second a study of the process of choosing between pleasant, unpleasant, and indifferent tastes (2, p. 167²). In the latter, the subjective estimates of self-activity were found to correspond remarkably with "the percentage decrease in resistance objectively registered by the galvanometer." All subjects reported the "full-blooded if elusive consciousness of the self-acting in some definite way" (3, p. 343).

To the objection that the concept of self is metaphysical, not psychological, Aveling very spiritedly replies. The criticism seems

* For a much more detailed discussion of this point cf. a forthcoming paper by the writer in the July, 1927, issue of the *American Journal of Psychology*.

to him "to be in itself of an entirely metaphysical character, to close the door to introspective investigation of consciousness, and to be contradicted by the facts of experimental psychology" (2, p. 169). It is of interest to note that Spearman (32), as well as Aveling, finds a self in experimental psychology. "Underlying all a man's apprehension of the characters of his experience," Spearman says, "he certainly possesses also the idea of himself as being the experimenter. . . . Any psychology of cognition that fails to account for this individual apprehending of an *ego* must be disfigured by a gap so wide and deep as to render it impotent to explain thoroughly the simplest event in either ordinary life or experimental procedure" (p. 54).

iv. The conviction that the self may after all be found in experimentally controlled introspection is strengthened by the outcome of Alfred Martin's *Experimental Study of the Factors and Types of Voluntary Choice* (26), a research carried out during 1920-21 in the Psychology Laboratory of Columbia University. In most of these experiments "the subject was asked during the fore period to imagine himself in a certain predicament, and then during the main period to consider two alternatives in order to solve his dilemma and make a choice between them. Full introspections were then taken" (p. 12). Examples of these dilemmas are the following:

"(No. 13) You are telling a story to an interested company, when suddenly you realize it has a personal bearing on one of them. Would you choose to disappoint your hearers by suddenly breaking off, or continue in deference to your audience regardless of the individual's feelings?" and

"(No. 11, R) You are preparing to attend a social gathering at a home not previously visited. Would you prefer to go in evening dress with a chance of being made conspicuous or in ordinary dress and perhaps feel out of place?" (*op. cit.*, pp. 16 f.). In the case of some of these decisions, including that last referred to, "the subject was next required to 'reconsider his decision with a view to its reversal'"—an adaptation, it will be observed, of the method of Ach.

The final factor in decision is, for all Martin's introspecters, what he calls "self-assertion"; and this he discovers "invariably involves a self-reference (p. 114), a determination, 'This is what I, myself, will really do'" (p. 58). Along with the self-assertion, however, is imagery, always including kinesthetic factors. Martin says expressly: "The results of the present work agree with that of Wheeler in asserting that the final act of choice results in a kinesthetic

image . . . but cannot sustain his conclusion that this is a complete and sufficient account of the matter. . . . There still appears one factor unaccounted for . . . the self" (p. 58²). And one of his observers, in a typical introspective report, makes the statement: "Underneath this was something not represented in imagery . . . the attitude 'I must take this reference to my past experience . . . as determining this present decision'" (p. 24). The difficulty found by his observers in reversing their choices offers, in Martin's view, additional "evidence" for "the fact that there enters in at the decision point something more" than the sensory and imaginal factors. "For," he argues, "if no other than these are present, then it is hard to see why . . . if no other factor like self-assertion intervened . . . there should be such difficulty in even entertaining the idea of a reconsideration of the situation" (p. 79).

Three types of decision are disclosed by the introspective reports. These are, first, "the Preference type, characteristic and most numerous," which "proceeds smoothly, implies a rich subjective experience, and is finally accompanied by a large measure of self-assertive tendency" (p. 114); second, "the Conflict type, vacillating in its character, also [implying] a rich fund of association but . . . somewhat lacking in regard to the degree of self-assertion that is present" (pp. 46, 114); and finally "the Indifference type . . . wanting in associative material, . . . apathetic" in its process, and "lowest in the strength of the final self-assertive tendency" (pp. 60, 114). Choice of all three sorts is distinguished as "subjective and ego-centric" (p. 57) from judgment, described as "impersonal and dispassionate" and "passive" (pp. 38³ f., 53⁴, 57); and is further marked off as "self-assertive tendency" from the "submissive tendency," the acceptance of direction from without, which is involved in the acceptance of task, or *Aufgabe*. There is a striking resemblance between these distinctions gained independently through experimentally controlled introspections, and the distinctions stressed in systematic self-psychology.*

Martin's results, in a word, effectively oppose "the possibility" that "self-reference" may be resolved "into a certain group of elementary and imaginal experiences." He readily admits the occurrence of these experiences on what he calls "the content side" of self-reference; but he unequivocally asserts that as the "contiguous presence" of "carbon, hydrogen and oxygen . . . in their neces-

* Cf. the writer's "A First Book in Psychology," *passim*.

sary proportions does not constitute 'sugar,' so, "that which is really characteristic of the self-factor, viz., the self-assertive tendency, cannot be so reduced but remains an irreducible . . . active principle that combines these elements into a self-entity" (pp. 106^a-107).†

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† It should be noted that Martin applies the epithet "unanalyzable" not to the "self" but to the "self-assertive tendency."

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THE FUNCTIONAL SIGNIFICANCE OF THE EXTRA-PYRAMIDAL SYSTEMS

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Following the original discovery by Fritsch and Hitzig of the electrical excitability of the precentral cortex, a very great amount of analytical work has been done on the function of the pyramidal tracts of the brain, somewhat to the neglect of the other efferent cerebral pathways. The reasons for this probably lay in the following facts: The pyramidal tract of man and the higher mammals is anatomically a very conspicuous structure and one readily studied by anatomic methods; it is readily excitable to various forms of artificial stimuli and causes readily observable changes of muscular activity; lesions of the internal capsule with the resulting paralyses are of common occurrence clinically; and the theory that the pyramidal tract serves as the efferent pathway for the execution of the voluntary movements is so readily applicable to psychological explanations. Contrasting with the availability of methods of study and conspicuous results of lesions of this system were the paucity of methods of study and the indefiniteness of results of the study of other efferent cerebral conduction pathways. It is indeed only within recent years that definite knowledge has been accumulated of the anatomical details of these extra-pyramidal pathways and it is still far from complete, and that clinical and experimental workers have seriously studied the problems of their functional meaning.

The term extra-pyramidal systems, strictly speaking, includes all the mechanisms of nervous control aside from the pyramidal tract, including therefore efferent cortical and subcortical systems. In the current clinical literature, the term extra-pyramidal system usually means the striatal and related systems of the brain stem, with sometimes a possible inclusion of the efferent frontopontile paths. In this somewhat limited but popular usage of the term, its study is in part equivalent to that of the functional value of the corpus striatum and the adjacent nuclei. In the larger meaning of the term, as seems to be implied in the recent studies of Lashley, it will also include the efferent cortical, nonpyramidal pathways.

Among the considerations that have compelled attention to the extra-pyramidal systems are the following: First, it was early recognized that both clinically in man and experimentally in animals, that although immediately following the actual destruction of local areas of precentral cortex or of the internal capsule there were definite paralytic effects, these disabilities were temporary, and that partial or complete recovery follows. Important factors in this recovery are effort on the part of the patient, training, and emotional facilitation (Franz (15), Lashley (31, 32, 33)). This recovery is not due to regeneration of the destroyed tissues or to vicarious action of the remaining excitable cortex (Sherrington (49, 50, 51)). Furthermore, Lashley has shown that in animals (rats and monkeys), learning of the ordinary so-called voluntary movements can be carried out in the absence of the excitable cortex. What is the mechanism of recovery and of the execution of movement after loss of the corticospinal system? Second, the anatomical demonstration of the existence of the efferent cortical frontopontile tract raises the question of its function. According to the recent review and neurologic studies of Minkowski, there exist efferent fibers from the following areas of the cerebral cortex: post-central, occipital, temporal, and gyrus angularis, in addition to the precentral and frontal areas. Also to be mentioned, are the descending connections of the olfactory areas, possibly of less significance in man than in the experimental animals. What are the functional values of these pathways? Third, within the cerebral hemispheres and below the cerebral cortex of all mammals, birds, and reptiles are two large masses of gray matter, the corpora striata, the functional value of which have long been shrouded in speculation, and are now being intensely studied both clinically and experimentally. Great clinical interest has centered around these systems following the histologic findings and expressed beliefs of many neuropathologists and clinicians, that lesions of the striatum and its connections constitute the pathologic basis of such disorders as paralysis agitans, chorea, athetosis, and a group of related conditions characterized by involuntary movements and disturbances of muscle tone, but with no true paralysis. Since the appearance of the detailed histopathologic studies of the human corpus striatum with the correlated clinical histories by Wilson (58, 60, 62, 63) and the Vogts (64, 65), the literature on this phase of the subject has become voluminous. Although much of this recent literature is marked by rather sweeping and speculative conclusions, certain findings are definitely of value clinically and physiologically. In this brief sum-

mary only the major aspects of the problem can be reviewed. Since the greater volume of this work has centered around the question of the functional value of the striatal system, this will be considered first, followed by a briefer summary of the studies of the other extra-pyramidal systems.

The anatomic position of the corpus striatum, deep within the cerebral hemisphere, has made the experimental analysis of its functional relations very difficult. It cannot be approached surgically except by first injuring the cortex, with the result that any observed effects of surgical or traumatic lesions are complicated by those of the associated cortical lesions. Associated vascular disturbances may also involve the adjacent optic thalamus, thus adding to the difficulties of technique. The older experimental work has therefore yielded little of conclusive value. According to Bechterew, electric stimulation of the lentiform nucleus causes tonic contractions of the contralateral extremities and of the neck. Since these effects were obtained after a preceding complete removal of the cortex and degeneration of the internal capsule, he concluded that the lenticular nucleus has motor functions, and that it is a center "in which reflex automatic centers are localized." The appreciation of the difficulties and uncertainties of this work led Wilson to apply to the problem the methods of localized stimulation and of small localized lesions by needle electrodes, rendered possible by Clarke's stereotaxic machine. In this valuable study it was definitely shown that in anesthetized Macaque monkeys the lenticular nucleus and globus pallidus are electrically inexcitable. There was no evidence of the tonic contractions of muscles or of convulsive movements such as had been described by the older workers. In this work it is of course obvious that anesthesia is itself a depressing factor; but since the precentral cortex is excitable under anesthesia, it is clear that any relation of the striatum to muscular activity must be relatively less direct than that of the cortex. Small unilateral electrolytic lesions caused "no signs whatever of motor impairment." With large lesions, there was some awkwardness but no paralysis or sensory defects could be ascertained. These definite observations of Wilson definitely discredited much of the inadequate preceding work, but the results are essentially negative and tell us nothing of the positive significance of the striatum. He concluded that "it is conceivable that a large lenticular lesion produces an unsteady effect in innervation," but the proof of this has been later acquired by clinical observations rather than by experimental means. However, it must be noted that in this work only

unilateral lesions were studied. There is other evidence that with bilateral lesions somewhat different results ensue.

Another method of approach to the problem has been that of studying the differential effects of decerebration with and without simultaneous destruction of the corpora striata. Such studies must be correlated with those of the comparative anatomy of the cerebrum. The results have been of interest, but because of differences in the actual structure of the brain of varied animals, as compared with that of the human brain, only tentative applications of these results can be made to man. In birds and reptiles the corpora striata constitute the great bulk of the cerebrum. The cerebral cortex is a very thin layer and quite dissimilar to that of the mammals. Destruction of the cortex in pigeons produces only slight deficiencies so far as ordinary behavior is concerned; there is nothing comparable to the paralysis following pyramidal lesions of the higher mammals. As long as the striata are intact, the pigeon can feed and protect itself and exhibits the ordinary cycles of breeding and nesting behavior. As has been recognized since the days of Flourens (1842), the removal of the cerebral hemispheres, the major portion of which are the corpora striata, abolishes all these so-called "instinctive" activities. These findings are of interest in connection with certain current clinical views that the striata are related to automatic or reflex actions. One interesting fact with reference to the avian striatum is that it is functionally a part of the nervous mechanism of feeding, and that one part of the avian striatum when electrically stimulated causes rhythmic movements of the beak as in feeding. This is in confirmation of an hypothesis advanced by Edinger, on grounds of comparative neurology, that the striatum correlates the oral senses with the muscular actions of the jaws and throat. Probably the best work of a similar nature in mammals is that of Rothman (48), who, repeating the earlier work of Goltz, has prepared a decerebrate dog which was kept alive for three years. In this animal all the general cortex was destroyed but the corpora striata were largely intact. After the first few weeks, this dog was not paralyzed, it walked and ran, and ate food if placed in contact with the nostrils. The writer has made similar observations on the opossum. In all mammals so far studied by adequate decerebration methods, all feeding activities disappear if, in addition to the cortex, the striata are also destroyed. On the basis of animal experiments it seems that the striatal complex plays some part in the execution of this important primitive type of behavior. Feeding involves a chain of coordinated rhythmic mus-

cular activities. The destruction of the striatum might conceivably remove an essential center of correlation or it might, in harmony with the conclusions of Wilson, lead to disturbances of muscle tone which render the feeding activity impossible.

The results of the converse of this experiment, namely, the destruction of the striata but leaving the cerebral cortex intact, have not been very definite. Clinically, however, this condition is approximated in cases of Wilson's disease in which there is gross bilateral destruction of the striata. Such patients can feed themselves, but it is to be noted that dysphagia is a common clinical observation in the cases of such lesions. There is some disturbance in the execution of this complex reflex action.

Following the suggestion made by Wilson, that the atrophy of the striatum in progressive lenticular degeneration may be due to a circulating toxin, attempts have been made to find a chemical substance with a specific toxic action on the corpus striatum. Of such substances the most striking effect is obtained with the salts of manganese. It has been known for some time that the inhalation of manganese dust produces toxic nervous symptoms. In a recent review by Edsall, Wilbur, and Drinker (9), the effects of manganese poisoning are described as follows: languor and sleepiness, mask-like facies, low monotonous voice, muscular twitchings of the arms, legs and trunk, peculiar gait, and uncontrollable laughter or crying. This is a symptom complex suggestive of that of paralysis agitans. This work has been continued experimentally by Mella, who has studied the effects of injections of manganese salts in monkeys. After three or four months there appear tremor in the hands, choreoathetoid movements with abnormalities of gait, and finally contractures of the hand and wrist. After death, histopathologic examination of the brain reveals extensive destruction of the nerve cells of the putamen, caudate nucleus, and the globus pallidus, with only slight microscopic evidence of injury in the cortex, cerebellum, or spinal cord. This seems to be a valuable method of study, for the results duplicate the cell changes described by neuropathologists in disease of the striatal system. Critically speaking, of course one cannot be certain that the chemical agent does not produce functional changes in the cerebral cortex not revealed by the microscopic picture, but that the major lesion is in the striatal system is clear. Of interest in this connection are the experiments of Edwards and Bagg (10), in which localized striatal lesions were produced in dogs by radium emanation. The effects were abnormalities of gait and posture but without paralysis.

Lewy cites experiments in which attempts were made to destroy the striate bodies without injury to the internal capsule by local injections of chromic acid. He considers that the effects—difficulty and poverty of movement, forced movements, awkwardness and rigidity—are manifestations of the striatal injury. The impossibility of confining the acid to one area within the brain substance is an obvious criticism.

A different method of study has consisted in observing the differences in the effects of a purely cortical lesion with those of a similar cortical lesion plus one of the underlying striatum. In marsupials and in rats the different effects of such lesions are quite striking. The effects of a pure cortical lesion are primarily those of weakness; the cortical plus striatal lesion leads to a definite and long lasting rigidity of the contra-lateral foreleg with prolonged contracture of the toes. The spastic element in these animals seems to be caused by the striatal lesion. In the anthropoid apes, the extirpation of the excitable cortex for the forearm, with no subcortical injury, leads to an immediate paralysis of the opposite arm and hand with inability to grasp. A month later this has disappeared and weakness is the principal deficiency. Clinically cases are on record of similar cortical extirpations in man with subsequent recovery from the immediately ensuing paralysis. Physiologically these effects are to be contrasted with the prolonged spastic effects and contractures to be observed in man after cerebral hemorrhage, in which the vascular lesion is usually one that damages both the internal capsule and the striatum or thalamus. The long continued effects of spasticity and contracture seems to be due to the loss of some other influence than, or in addition to, that of the excitable cortex. Care must be exercised in considering the pathologic physiology of such lesions in man, for the frontopontile tracts may be involved as well as possible injuries to other subcortical nuclei, notably the optic thalamus.

An attempt to evaluate the experimental work on the corpus striatum is in part, therefore, a statement of the complexities of the problem. From the point of view of comparative neurology, the corpus striatum or its precursors can be recognized in all vertebrates, but the anatomical details are quite different in each class. In the lower forms, fishes' amphibia, and reptiles, there has been little or no adequate study of the functional value of the striatal complex. In the birds only a beginning has been made (Rogers (46), Hunter (26), Langworthy (30), Beritoff (6)). As to the mammalian forms, a somewhat more definite statement can be made.

The striatal complex has little or no direct connections with the

cerebral cortex. Anatomically and phylogenetically it seems to be largely an independent system whose activity is correlated with that of the cortex by indirect connections through the thalamus or mid-brain. Hence the anatomic basis for the view that the striatum is related to involuntary movement. The thalamo-striatal connection (ansa lenticularis system) is phylogenetically one of the oldest cerebral tracts and one of the earliest to become myelinated in the human brain (Vogt (64, 65)). All of these considerations suggest that the striatal influence must be an elemental one. The experimental evidence is in harmony with this view, although certain clinicians (Jakob (27)) do not agree with this phylogenetic inference. The experimental evidence in all animals from birds to monkeys, indicates that the striatal system exerts *some* influence on reflex action but the nature, mode of action or necessary conditions are not clear. So far as the evidence at present applicable will show, electrical excitability is not a primary characteristic. Its action whether tonic, steadying, or inhibitory, is therefore exerted only as one link in a chain of neurones playing on the motor neurones. The details of this influence are still an open problem.

During recent years, the greater amount of work on the problem of the striatum has been done by clinicians and neuropathologists. The recent literature on this subject is very extensive and in many cases characterized by unjustifiable speculation based on limited clinical material. But this criticism can not be hurled broadcast at all of this work. The difficulties are tremendous. The work is such that the patient must be observed frequently through many years; there must be adequate post-mortem examinations and the brain examined by serial sections. Furthermore because of the variations in the clinical picture this must be done on many individuals. Finally in the interpretation of results all the variety of functional factors exhibited by nervous tissue in response to injury have to be considered: deficiency effects due to destructive lesions, and stimulation effects due to irritative lesions, with compensating factors in both cases, diffuse lesions involving to varying degrees both cortical and subcortical structures, etc.

A variety of diseases of the nervous system have been classed as due in whole or in part to disorders of the extra-pyramidal or basal ganglion systems. Primarily, these are diseases of disturbed muscular activity. Among these are paralysis agitans, the various types of choreas and athetosis, Wilson's disease, torsion spasm, Foerster's arteriosclerotic rigidity, post-encephalitic parkinsonism, and prob-

ably, certain symptoms associated with pyramidal lesions. In varying degrees all these conditions present symptoms difficult to attribute to localized disease of the cortical or pyramidal system.

The reasons for this belief are twofold. First, histologically in certain cases of these disorders that have come to autopsy and have been adequately studied, lesions have been found, sometimes localized, sometimes diffuse, involving the basal ganglia, the mid-brain, or both, but with little or no microscopic evidence of injury to the pyramidal system. In spite of the labor involved in such studies many of them can be of only limited value in analytical studies of localization of function since so frequently the lesions are diffuse, affecting simultaneously widely scattered areas of the brain. But there are certain cases on record in which the lesions have been localized and these are of the greatest value. Second, the clinical picture of these disorders is quite different from that of lesions of the pyramidal tract. Characteristic of pyramidal lesions are, paralysis of the spastic type, and contractures affecting particular groups of muscles (areas of predilection) exaggeration of the tendon reflexes and alteration of certain cutaneous reflexes. Although these are commonly accepted clinical teachings, it is not clear whether all of these effects, *e.g.*, contracture, can be considered as purely pyramidal in origin, and may not also involve extra-pyramidal structures. Certain it is however that many cerebral lesions do cause mixed pictures of effects due to both systems and the functional analysis of such cases is therefore extremely difficult. Extended discussions and reviews of the pathophysiologic relations of the extra-pyramidal conditions from the clinical point of view have been given recently by Foerster (12), Lewy (34), Jakob (27), Wilson (63), and others.

In 1817 James Parkinson in a classical paper entitled "An Essay on the Shaking Palsy" first clearly differentiated the condition now known as paralysis agitans. This condition is commonly characterized by absence of motor paralysis or sensory disturbances, by a fine and rapid tremor, which may involve the arms, legs, head and face, present during rest and increased by emotional stimuli, an increase in muscle tonus or rigidity with resulting abnormalities of attitude which are strongly maintained. This rigidity is much less susceptible to reflex inhibition than that due to a pyramidal lesion and diffusely affects all muscles alike. According to Wilson this latter statement is not exactly correct; there are areas of predilection in parkinsonism affecting a certain group of small muscles more specifically than others. These are the lingual, optic, interosseal, facial and laryngeal

muscles. Wilson states that there are areas of predilection but they are different from those of the pyramidal type.

There is no true paralysis but a great poverty of spontaneous movements and these are imperfectly or incompletely performed. Voluntary movements can be carried out but with persisting rigidity it becomes of increasing difficulty. The thing of "cardinal" significance is the rigidity (Foerster). There is a characteristic fixation of the facial musculature—a mask-like face, monotonous voice, and absence of spontaneous gesture. In part this may be due to the rigidity, but since this symptom may appear with only a slight rigidity, Foerster and others question whether there may not be a psychic share in the disease. Tremor, hypertonicity, and poverty of spontaneous movements (hypokinesia), of normal associated and expressional movements are the major symptoms of the disease.

Parkinsonism presents a clinical picture quite different from that of any known disease of the cortico-spinal system. The pathologic basis of the disease has been very extensively studied during the past fifteen years by numerous workers. Particularly to be cited are the studies of C. and O. Vogt (64, 65), Hunt (23, 24, 25), Marie (39) and Tretiakoff (52). Hunt states that in the juvenile type of paralysis agitans there is a slowly progressive atrophy of the large multipolar cells of the striatum and globus pallidus without gross cortical disease and in the adult type of the disease, there are vascular degenerations of the same areas. The Vogts describe a state of disintegration of the cells of the striatal system which is pathognomonic of paralysis agitans. Tretiakoff found bilateral lesions affecting chiefly, but not exclusively, the substantia nigra. Many subsequent pathologists consider the lesions of the latter area particularly characteristic of post-encephalitic parkinsonism. According to Wilson, the essential pathology of parkinsonian disease consists of degeneration of the striatal cells and fiber systems.

These studies indicate that the pathologic basis of Parkinson's disease is a degeneration of the subcortical striatal system and have served as the basis of many highly speculative theories (Hunt (23, 24, 25)) of the mechanisms of motor control by the corpus striatum. The continuation of this work with increasing refinements of technique has added many complicating difficulties to the interpretation of these initial studies. If one studies the data of the very extensive, detailed and valuable clinical work of Lewy, one is struck by the great diversity of histologic findings in the successive cases of paralysis agitans. There are lesions of the striatum but lesions may also

occur throughout the brain from the cortex to the cord; cerebral cortex, striatum, thalamus, cerebellum and pons. They are not confined to the striatum. As stated in a recent review by Hassin and Bassoe, there are diffuse changes in the brain stem not localized to any one part. It can only be stated that the greater amount of damage histologically evident is in the extra-pyramidal system with lesser changes in the cortex. "Which particular part of this complicated system is principally involved cannot be decided at present." An impartial review of the histopathologic reports indicates that similar clinical symptoms may result from a variety of lesions quite differently located.

A second group of disorders of muscular function, those of the involuntary movements of choreo-athetosis, were assigned to the striatal system in 1896 by Anton (1). After pointing out that the experimental physiological studies had yielded only doubtful and contradictory results and that we have almost no knowledge of the physiologic significance of striatal function, he concluded that this could be determined only by clinico-pathologic observations. Anton reviewed the preceding literature and added a case history of this type with autopsy and histologic study of the brain. The patient exhibited generalized muscular unrest, excessive motility of irregular spasmodic character, and incoördination. In the intervals when these movements died out, voluntary movements and control was present. The microscopic study of the brain revealed bilateral degenerative and fibrous changes confined strictly to the putamen and not affecting the internal capsule. Recognizing the preceding work of Strümpell, he pointed out that the normal execution of muscular activity not only required stimulation of the active muscles but also inhibition of the opposing muscles with a proper coördination of these two phases. "It seems to me that the mimetic and associated movements are regulated or organized through the optic thalamus and its connections and that the disease of the striatal system sets free these automatic movements"; that is, the striatal system has an inhibitory effect on the activity of the thalamus and mid-brain. This therefore provides "a supplementary nervous system" to the pyramidal one. "It is very important therefore to determine how the two systems operate concurrently and their functional interrelations. One of these systems seems primarily related to the innervation relations of automatic movements, the other to voluntary innervation, and disease processes separate the two." The belief thus expressed had great influence in the subsequent clinical studies in this field. Only recently,

in the Croonian lectures of Wilson has there been adequate clinical criticism of this too highly simplified scheme.

The subsequent studies of the neurologic mechanisms of the involuntary movements of chorea and athetosis have yielded a variety of conclusions by individual clinical workers on individual cases. A priori, it seems obvious from the physiological point of view that a very great variety of widely different lesions might lead to involuntary movements. Clinically, there are differentiated several distinct groups of chorea, of athetosis, and of mixed conditions. The most elaborate studies of the pathology of these conditions are those of the Vogts (64, 65) who recognize eight different groups of pathologic alterations of the striatum, certain ones of which they associate with choreo-athetosis. In acute chorea, Marie and Tretiakoff described inflammatory changes arranged in the order of intensity as follows: caudatum, putamen, locus niger, thalamus and cerebral cortex. In the chronic chorea of Huntington occurring in adults, according to many workers (cited by Lhermitte (36)), the pathologic lesion is principally in the caudatum and putamen, but diffuse changes occur elsewhere. Hunt (23, 24, 25) localized the disease to the small ganglion cells of the striatum. According to Jakob (27), the anatomic basis of these disturbances lies in the ansa lenticularis system, connecting the striatum, globus pallidus, corpus Luysii, substantia nigra and the nucleus ruber. If cortical changes are present, he considers these may lead to psychic disorders but these are incidental to the motor changes.

On the other hand a very interesting case of involuntary athetoid movements of the arm was described by Horsley (22) in which relief was obtained by the surgical excision of the corresponding area of the precentral cortex. However a repetition of this surgical method by Maas (37) on a similar case gave no relief. In an attempt to experimentally produce this type of motility disorder in animals, Lafora (29) found that lesions of the superior cerebellar peduncle, of the hypothalamic region or of the nucleus ruber, causes athetotic or choreic symptoms which may persist for several months. This is an experimental confirmation of the recognized clinical "Binde-arm" chorea. In his criticism and summary of this subject, Wilson points out that for the occurrence of such disturbances, the cortico-spinal tract must be relatively intact; that there is a disorder of the regulation of the afferent impulses, particularly between the cerebellum and the cortex which maintains continuous stimulation of the cortical

mechanisms, thereby discarding the striatal lesions as the primary causative factor in the production of this type of disease.

A third group of disorders of motor function that is related to extra-pyramidal disease is presented in the group of intergrading clinical conditions known as progressive lenticular degeneration, pseudosclerosis and torsion spasm (or dystonia musculorum deformans). As described by Wilson, progressive lenticular degeneration "seems to be a pure syndrome of the corpus striatum." This condition is characterized by the absence of true motor paralysis and sensory changes, by involuntary movements, tremor, diffuse muscular rigidity of the limbs and face, disturbances of speech and swallowing, emotionalism, and contractures in the final stages. The autopsy examination revealed bilateral and symmetrical softening of the lenticular nucleus, involving the pallidum to a lesser extent but with the internal capsule and thalamus intact. The disease is associated with hepatic cirrhosis. In the dystonias or torsion spasms, the involuntary movements may become violent with the assumption of the most abnormal or demoniacal attitudes. Clinically pseudosclerosis offers a greater variety of symptoms correlated with more diffuse lesions, present in, but not confined to the striatum. According to Hadfield, the symptoms are similar to those of progressive lenticular degeneration but differ quantitatively; with less violent muscular disorders and greater mental changes associated with the cortical disease. According to the definite clinical and pathologic findings cited by Wilson, it seems clear that the destructive lesions of the striatum "remove a normal inhibiting or rather steadying influence which the corpus striatum exerts upon the anterior horn cells" and hence upon muscular activity. A similar conclusion is drawn by Hunt. This view of striatal function is widely prevalent. On the basis of clinical grounds it can not be lightly dismissed; it is not based on experimental work on animals whose cerebral development is quite different (as is stressed by Jakob) and the positive clinical and pathologic data can not be questioned. However following the impetus given to such studies by Wilson's work, subsequent workers (Greenfield, Poynton and Walshe (18)) question whether this disease can be considered a disease of the striatum alone. Many subsequent workers (cited by Barnes and Hurst (3)), describe lesions in Wilson's disease, not only in the striatal system but also in the thalamus, cortex and rubro-dentate tracts.

Clinical records and histopathologic studies therefore reveal a wealth of extraordinarily complicated and sometimes conflicting data.

In considering the statements of Anton (1) that the functional value of the striatal system can be revealed only by clinico-pathologic studies, the question may now be asked, what have such studies contributed to this problem in the thirty years since his paper appeared? There have appeared many papers attempting to interpret this mass of neurologic data. Some of these have been so highly speculative as to be of little value save possibly as working hypotheses. Others, notably the clinical summary of Foerster (12) and the recent clinico-experimental study of Wilson (63) are based on such extensive experience and careful analysis as to command consideration.

Foerster recognizes the difficulty of the analysis of the pathologic physiology of extra-pyramidal disease; difficulties consisting of the variety and inconstancy of motor disturbances, of variety of the pathologic lesions and of the incomplete knowledge of the anatomic substratum. He classifies the varied clinical pictures under the following groups: pallidal syndrome, striatal athetotic syndrome, choreatic syndrome, and torsion spasm.

The globus pallidus is active in innervation in inducing and augmenting associated movements and determining the sequence of movements, and for the reactive and expressive movements it can be considered a central motor station. It has an inhibitory effect upon the underlying cerebellar and hypothalamic systems and is thereby related to the regulation of muscle tonus and the attitude reflexes. Its destruction leads to difficulty of voluntary movement, showing itself by poverty of spontaneous movements, slowness of execution, reduced excursion and fatigability, and to a deficiency of associative movements (hypokinetic components); and to increased resistance to stretching of the muscle, fixation tension, tremor and anomalies of attitude (rigidity components). In this system the innervation function of the pallidum is demonstrated by the paretic components and the inhibitory function by the spastic components.

Foerster, accepting the pathologic work of the Vogts, considers the athetotic syndrome as due to disease of the caudate and putamen. It is marked by the athetotic play of motility, by a reduction of the plastic form-giving muscle tonus in the intervals of rest, anomalies of posture, overextensibility of muscle and excessive reactive, expressive, and associated movements. The striatum is considered to exert an inhibitory influence upon the pallidum, disease of the striatum releasing the pallidum from control. Afferent thalamic impulses exert a mass effect upon the pallidum with resulting excessive motility. The fact that in this clinical review of Foerster cer-

tain phylogenetic considerations are advanced is interesting, although the details of the attempted localization of striatal function can hardly be considered as demonstrated.

The choreatic syndrome, following the work of Hunt (24), is considered as due to disease of the small ganglion cells of the striatum, thereby releasing the globus pallidus from control. The syndrome exhibits many symptoms similar to that of the athetotic syndrome but the extent of the involuntary movements is lessened and the movements are quicker and more hurried. The hypotonia may be due to cerebellar involvement.

The torsion spasm or convulsive syndrome is related to the athetotic syndrome, but with more violent movements and is thought to be due to a selective failure of striatal inhibition to the pallidum.

The primary result of this clinical work is therefore to establish a scheme of localization of function of the striatal system, which is of clinical value in diagnosis and is of physiological interest so far as localization of function is concerned. As such, these clinical studies *if the conclusions are correct*, are of interest as contributing steps toward the solution of the problem of the mechanism of normal muscular activity as expressed in posture and behavior. Both the experimental and the clinical work so far cited, indicate that in normal muscular activity a dual system is involved; the cortico-spinal (pyramidal) and the more diffuse, less direct, extra-pyramidal. There is a balanced action and integration of the two in the normal individual. The extra-pyramidal system is the only type of control present in the lower vertebrates; the pyramidal type reaches its greatest size and functional value in the anthropoid apes and man. So far as can be judged the development of the cerebral cortex has not abolished the functional activity of the basal ganglion system. Anatomically, the two systems seem to be largely independent of each other as there is little or no direct connection between the corpus striatum and the cortex. Clinically localized disease of the striatal system leads to muscular disability which the patient can not control. In what way and to what extent has the cortical influence altered the activity of this subcortical system? How are the two co-related in the normal individual? Is there any common ground to the phylogenetic, experimental and clinical studies of this problem?

These are questions not easy to answer. A most valuable discussion of functional changes from the phylogenetic viewpoint has recently been given by Herrick (21). Physiologically, schemata of localized centers that control emotional or expressive activity, auto-

matic movements, of tremor, etc., are insufficient. These questions demand preliminary functional studies of the mechanisms of normal muscular activity, of the balance and sources of inhibitory and stimulating influences that lead to alterations in muscle tonus or postural activity, of the correlation of activity in many muscles to produce a given useful or purposeful action and the putting of these at the service of the individual, and the mechanisms of the nervous system whereby these things are done. It is not surprising therefore that the clinical interest in the extra-pyramidal diseases has led to new experimental attacks on these problems of the detailed mechanisms of tonus regulation and its abnormalities, of neuromuscular coordination and integration. Fundamental to this study are the principles of the integrative action of the nervous system as described by Sherrington and the reflex mechanisms involved in postural activity as described by Magnus and many others, and the tonus regulating action of the cerebellar system (Walshe).

The clinical analysis of extra-pyramidal disease stresses disturbances of muscle tone, hypertonicity, rigidity, or hypotonicity as a cardinal symptom. Hence there is great interest in the modes whereby muscle tone is regulated. Sherrington (49) long ago pointed out the primary importance of the proprioceptive impulses in this connection. A host of workers have studied the varying influence of labyrinthine impulses on muscle tonus particularly of the head and neck, and of afferent impulses in turn arising from the neck muscles and playing on the body musculature (Magnus (38)). Optic impulses via the brain-stem play upon the muscle innervation systems. Luciani long ago recognized tonus disorders, forced movements and abnormal attitudes as characteristic of cerebellar lesions. Here are a large group of nervous influences distinct from the pyramidal system that play a most important part in controlling muscular activity. Their pathways form a highly complicated system within the brain-stem.

Long-continued postural or tonic activity is characteristic of this subcortical motor system, as phasic or short lasting activity characterizes cortical motor control. Furthermore, "nonpostural cerebral activity seems to abolish the postural mid-brain activity" (61). The decerebrate rigidity that follows the abolition of the mammalian cerebral hemispheres and thalamus by transection through the mid-brain, illustrates this tonic type of nerve activity. It must be due to the uncontrolled or released activity of the nonpyramidal systems below the thalamus. Many attempts have been made to determine the

source of the stimuli that inhibit this type of activity in the intact brain. Three possible sources have been suggested; the excitable cortex, the frontal cortico-cerebellar system or a thalamo-striatal system. The answer to that question would be of contributory aid to extra-pyramidal physiology. Peculiar interest attaches to this problem because of the apparent similarity of this prolonged muscular activity in decerebrate rigidity to the prolonged spastic muscular contraction following many cerebral lesions of man, and much of the recent clinico-experimental work on spastic paralysis, centers around this problem (Hunter (26)). Numerous experiments have shown that in animals this rigidity inhibiting influence can not be from the cortex exclusively, for the removal of the cerebral hemisphere leaving the thalamus intact, does not lead to rigidity. This rigidity is a proprioceptive reflex, but it is dependent not only on the integrity of the local reflex arc, but also on some influence from the brain-stem. It is influenced by, but not solely determined by labyrinthine and cerebellar impulses. The nucleus ruber and rubro-spinal tracts are not essential as has been demonstrated by Bazett and Penfield (4). According to these workers "It would seem that the tract whose interruption is responsible for decerebrate rigidity has its origin about the level of the hypothalamus." Clinicians rightly emphasize that these animal decerebration experiments can not be indiscriminately applied to the human brain, for in the few, but important, cases of human decerebration, spastic rigidity is present with the thalamo-striatal connections largely intact (Edinger (8), Jakob (27)). From the clinical side therefore the loss of cortical inhibition as a contributing factor can not be dismissed. Jakob in the case described by him, attributes the rigidity to unopposed activity of the pallidum. On the other hand the actual extirpation of motor cortex in apes and man, though leading to a temporary spasticity, is not followed by the prolonged spastic contraction and contractures that mark the subcortical destructive lesions of the internal capsule. Wilson (60) and Walshe (55, 56) have described cases of decerebrate rigidity in man and give valuable discussions of this problem and its implications. Many of these clinical findings do not harmonize with the results of animal experimentation. Comparative studies correlating this type of activity with the varying degrees of cerebral development shown by different animals will be of value in this connection (Weed, Langworthy (30), Bagley (2)).

There is increasing evidence that the frontal cortex plays a definite part in the processes of neuromuscular coördination. According

to Warner and Olmsted (54), stimulation of the frontal cortex has an inhibitory influence on extensor rigidity. The fronto-pontile tracts furnish an anatomic pathway for such control which may involve cerebellar participation. Furthermore, Olmsted and Logan (43) have described various extensor phenomena that appear in cats after lesions of the frontal cortex, although there is no paralysis so far as ordinary behavior is concerned. These results are not only of analytic significance but also of clinical interest because it is known that lesions of the frontal lobes, not directly involving the excitable cortex, may lead to disorders of muscular activity. According to Foerster (12) lesions of the frontal lobe, tumors, softenings or contusions, may lead to disturbances of muscle tone, to stretching and fixation tension, to anomalies of attitude, rigidity and poverty of movement, with reflex findings similar to those of the pallidal syndrome.

The rôle of the cerebellar system in this connection has been described recently by Walshe (55). He emphasizes that the cerebellum must not be thought of as a physiologic entity: it has no functional meaning as an isolated organ, but must be thought of as an adjuvant and in terms of its functional connections. To a large extent it is the organ through which the cortex influences postural activity in the interest of coördinated purposeful activity, and hence if the cerebrum is intact it is essential to postural regulation; otherwise it is not.

Another phase of interest aroused by the extra-pyramidal studies involves the fundamental question of the mechanism of the correlation of activity of many muscles in the execution of normal movements. Recent outstanding contributions on this phase of the subject from the clinical side are those of Foerster (12), Lewy (34), and Wilson (63).

As long ago recognized coördinated movement involves the participation of several groups of muscles, the protagonists, antagonists and the synergistic or supporting muscles. The simplest purposeful movements involve the discharge of nervous impulses graduated in time and number, that will stimulate the protagonist, inhibit the antagonist to the proper degree and set the synergists to the proper supporting attitude. Obviously motility abnormalities will result if any one of many essential conditions are altered; if tonus is too great or too low, if there is not the proper gradation of intensity of stimulation, if the inhibition of antagonists is too sudden or does not occur, if the synergistic support is excessive or is inadequate.

In such studies the time relations can be determined by myographic tracings. Since the introduction of the string galvanometer, the discharge of nerve impulses can be detected under certain conditions. Both methods have been employed in attempts to analyze the underlying neurologic processes. Unfortunately, at present our knowledge of the relations of the action currents recorded by the electromyogram to that of the discharge of nervous impulses is not sufficient to permit the use of the former as an accurate index of the nervous processes. The greatest caution is therefore required in the interpretation of such studies. It is of value in picturing the muscle activity, not the antecedent or simultaneous nervous processes (Forbes (14), Wacholder (53)).

According to Lewy (34), each movement involves a series of reflex chains constituting the reflex figure which determines the action of the three groups of muscles. The initial reaction follows these principles. In simple passive movement there is complete reciprocal inhibition of the antagonist but in simple voluntary movement there is a "quite different" mechanism. There occurs first, a setting of the protagonists and synergists, followed by a sudden relaxation of the antagonist simultaneous with the protagonist contraction, which in turn is followed by a second contraction of the antagonists (through successive induction), a protective reaction against excessive movement and an aid in the fixation of the joints. This antagonistic contraction aids in giving support and strength to the movement. Synergistic action rises slowly and reaches its height only when the protagonist is relaxing. Lewy recognizes three types of movement configuration designated as the pyramidal, extra-pyramidal and the asthenic.

In pyramidal lesions there is deficient reciprocal action affecting certain groups of muscles. Resistance to protagonist activity is offered by a paradoxical increase in tension of the antagonist: the initial antagonistic contraction is increased and in the subsequent successive induction still further increased so as to offer intense resistance to the protagonist, particularly for brisk activity. In the extra-pyramidal type, areas of predilection are wanting with the rigidity affecting all muscles alike and the antagonistic resistance may be overcome by forceful activity, but as the movement progresses this resistance gradually increases. There is maintained after-contraction of the antagonist and frequently of the protagonist which contributes to the deficient kinesis. Reciprocal innervation is retained but there is an irregular discharge of impulses causing the tremor. In tabes

(asthenic type) there is a false innervation rhythm with the primary inhibition of the antagonist occurring too soon and with delay or absence of the secondary supporting antagonistic contraction. Hence the movements are not precise, are wavering and weak.

In normal activities there are present in addition to the primary protagonist contraction, a great variety of secondary associated activities of which we are frequently unaware. Examples of such actions are the swinging of the arms in walking or the turning of the head associated with movements of the eyes. (A long table of such movements are listed by Wilson in his Croonian lectures). This type of activity that determines the spontaneous play of expression and gesture, is deficient in extra-pyramidal disease. This deficiency is regarded by Lewy and by Foerster as central in origin, determined largely by the paleostriatum but perhaps in part by disturbances of the thalamic or cerebellar systems.

Perhaps the greatest significance of these studies lies in the fact that clinical neurology is turning with increasing interest to the experimental analysis of the mechanisms of muscular activity. Not all the detailed findings can be considered as established. Indeed within the past year, Wacholder in a series of studies of the physiology of voluntary movements points out detailed errors in the work of Lewy. From mechanical and electromyographic studies, he points out that rigid action schemata are quite impossible, that variability is characteristic, that the action current patterns vary with a number of conditions, with direction of movement, resistance to movement, rate and amplitude of movement and with variations in the mechanical factors offered by joints, muscle fixation, etc. As maintained by Foerster (11), there is no definite scheme but only coördination of each component in relation to the preceding plan of movement. Furthermore, "In the healthy individual, executing purposeful complex movements there is more or less incoördination. The normal individual is ataxic to a certain degree" (Pfahl cited by Wacholder (53)). Wacholder finds that the synergistic action may start before that of the agonist and hence is centrally determined and not a secondary reflex incited by contraction of the protagonist. For the activation of the antagonists he finds that there is no generally applicable action scheme but a variety of patterns dependent on the conditions of movement. There are two principal groups; the first type is marked by periodic groups of action currents, the periodicity being more marked as the rapidity of the movement increases. This periodic type is the usual one in antagonistic activity. The second

type marked by maintained action currents, occurs during passive movements and seems to be the principal type of innervation in rhythmic movements. He is unable to confirm Lewy's statements that antagonistic contraction follows the initial antagonistic inhibition. To the present writer, these results seem more in harmony with our knowledge of the real plasticity, adaptability and variability of activity of the nervous system, than the localization schemata based on clinical inference, howsoever valuable (or the converse) these may be in diagnostic work.

If now one seeks to correlate such studies on the neural mechanisms of muscular coördination with those of the disturbances of extra-pyramidal disease it is difficult to avoid the conclusion, as is indicated by Wilson, that the assignment of a specific rôle to the striatum in this process is not proven. Striatal influence, important as it seems to be from the clinical side can be only one component in the process of integration, which as indicated by a host of workers may involve a great variety of spinal, brain stem, cerebellar or cerebral mechanisms. In this sense it seems that the recent work of Wilson most closely approximates the real functional significance of the extra-pyramidal system.

From the known pathologic and clinical findings. Wilson points out that the cardinal symptoms of striatal disease consist of dystonia or variability of muscle tone, involuntary movements and absence of "true" paralysis. The indefiniteness of the terms "voluntary" and "paralysis" is recognized and analyzed. In order to determine if there is any impairment of motility, an examination of normal motor phenomena is essential as a control. On the basis of measurement and observation, Wilson recognizes the following deficiencies in voluntary movements in striatal disease, slowness in initiation, weakness and poverty of movement (akinesia). The akinesia seems to be due to reduction in the normal impulses to movement and can not be attributed to any one factor, that is, the striatum alone, but may arise from any one of the three levels of action as defined by Hughlings Jackson. The failure to recognize this led to the conception of the hypokinetic rigidity syndrome of the striatum. After a detailed study of many associated movements, he finds himself "unable to agree with Foerster who states that these movements are lost" and that the striatum is a center for their activation. They are slow or weak but not lost. The paucity of movements of emotional expression occurs in other diseases with an intact striatum, hence the striatum can not be considered a local center for such

activity. Hypertonicity is characteristic of striatal disease and this in turn makes movements difficult and leads to abnormalities of posture.

In studies on the rôle of the antagonistic muscles he is unable to demonstrate any alteration of antagonistic action, of defective inhibition, or tendency of the antagonists to come into action before the prime movers. He is "led to the decision that the normal combining of protagonist, synergic and antagonist muscular elements cannot be regarded as a function of the corpus striatum."

The analysis of the involuntary movements chorea, athetosis and tremor, is recognized as a very difficult one. They cannot be due to degenerated centers that are not functional. The problem is "not what mechanisms are paralyzed but what mechanisms are active." They may be irritative or release effects. Since the pathology of the choreas and athetoses exhibit diffuse lesions with the corticospinal tract relatively intact, these movements are thought to be due to cortical activity. The possibilities here are numerous. Wilson thinks that disordered regulation of afferent cerebello-cerebral impulses keeps up a persistent cortical stimulation. Hence such movements are "involuntary cortical activities." Tremor he thinks is due to disordered function of the brain stem centers. In conclusion he believes that the striatal function must be relatively simple, one primarily related to the regulation of muscle tone. The disorders of muscle tone are due to the freeing of nonstriatal mechanisms from striatal control.

Such a conclusion as to striatal function now leaves us facing two quite different but interrelated questions. The first relates to the control and variations of muscle tone or postural activity, and the second to that of further knowledge as to the mechanisms of muscular coördination in the execution of normal activities and movements. This is not the place for a further discussion of these questions save to point out that the control of tonic activity may involve intrinsic, chemical or vascular factors, possibly endocrine factors (particularly parathyroid) and the local spinal as well as cerebral or subcerebral influences. With reference to the second question, Lewy and Wilson both point out that further progress is more likely to come in clinical lines, by the study of the apraxias. Along experimental analytical lines this will involve the study of the presence, absence or alterations of behavior and learned movements following various types of cerebral lesions. Of particular significance therefore are such experimental studies of this type of the effects of lesions

of the extra-pyramidal and the "silent" areas of the brain (Franz (15, 16), Lashley (31, 32, 33)). Such work demonstrates the existence of other pathways of cortical discharge than the pyramidal fibers. The significance of this work in relation to the problems of learning has been so carefully evaluated by Herrick (21), that further reference here is unnecessary. In how far such studies can be correlated with the clinical analyses of the aphasias and apraxias will be an interesting development of the future.

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SPECIAL REVIEWS

FELIX KRÜGER. *Komplexqualitäten, Gestalten und Gefühle. Neue Psychologische Studien*, 1926, Bd. 1. Pp. 1-121. C. H. Becksche Verlagsbuchhandlung, München.

The *Neue Psychologische Studien* are the new journal of the Leipzig laboratory, the *Psychologische Studien* having been discontinued after Wundt's death. The journal will bring reports on research done at Leipzig. Most of the work will be along experimental lines, genetic problems being considered in so far only as they are related to the problems under discussion. Krüger is the editor and the present paper serves as an introduction of this new venture. He gives an outline of the work done under his direction and presents his standpoint in regard to the theory of the whole-quality (*Ganzheitslehre*).

F. M. URBAN

Brünn

Psychologies of 1925. Worcester: 1926. Clark University. Pp. 412.

Interesting collection of lectures from the points of view of the different "schools" of psychology by different hands given under the Powell Lectureship at Clark University.

The first four papers are from the behavioristic viewpoint. Watson contributes the first three of these. In the first lecture Watson considers the original nature of man and discusses those reactions which the organism displays untaught. The conditioning of these is considered and this is even placed back into the embryonic life. At the end, Watson gives a diagram of the "activity stream" which he wants to replace James' "stream of consciousness." The second lecture deals with Watson's views on the growth of emotions. Fear, rage and hate seem to be unlearned reactions and out of these the more complicated emotions are fashioned. The third lecture outlines Watson's well known experiments on the conditioning of emotional stimuli. Hunter contributes the fourth lecture from the behavioristic point of view. He contrasts psychology and anthroponomy in an effort to formulate the anthroponomist's attitude toward certain problems of psychology. Psychology primarily studies the

environment of the reaction animal, while anthroponomy rather chooses as the environmental object of study the reaction animal itself.

Woodworth contributes a lecture on dynamic psychology. Dynamic concepts must be employed throughout psychology and are needed no matter what the "school" of psychology one assumes. This is brought out by an analysis of the problems of perception.

There are three lectures from the point of view of *Gestalttheorie*. Of these Koffka contributes the first, on mental development. There are three types of reaction: reflexive, trained and intelligent. These represent three different stages of mind. The discussion involves which is the primitive form and how the others grow out of it. We must believe that "the situation forces the animal to act in a certain way, although the animal possesses no preestablished special devices for the act." The other two *Gestalt* lectures are given by Köhler. The first discusses his well-known ape results. In this he especially emphasizes the fact that imitation is not a simple affair but that it is an achievement of some significance. The second lecture explains the general theory of *Gestalt* as applied to the visual field for color and form. The following general conclusion is reached: "Reorganization of the field by subjective stress, if the field is not too stable, seems to be an important side of intelligent behavior. But the subjective stress is as much a function of the field as the field is of the stress, both being dependent sides in the total situation."

Five lectures are gathered under the title of purposive groups. Prince contributes the first three of these. In the first, Prince points out three fundamental errors of the behaviorists, namely: (1) the denial of consciousness as cause of bodily reactions; (2) behavior cannot to-day be completely explained in terms of the correlated neural and other bodily processes alone; (3) by confining themselves solely to the use of objective methods. In his second lecture, Prince presents a biological theory of consciousness. From a study of abnormal and borderline states, Prince finds that "consciousness is not synonymous, coextensive or identical with self-awareness . . ." This leads to the third lecture on personality. Personality is not a unity in the sense of being a functioning whole. It comprises many different components of which various ones and a varying number, from time to time, engage in activity as mental and physiological processes and manifest themselves as traits of character. McDougall contributes the last two lectures of this group. Arguments are advanced to show that all forms and varieties of behaviorism are

inadequate, and this leads to an attack on the whole mechanistic position.

Under the heading of reaction psychology, Dunlap gives three lectures. The psychologist has to deal primarily with a world of private content. This is the world of our own bodies, which we perceive through kinesthesia and organic sensitivity (including the feelings and emotions) and which no one else can perceive in that way. In the second lecture, Dunlap formulates the general laws of experimentation. The special methods of psychology are discussed in the light of this formulation. Dunlap's third lecture is on the application of psychology to social problems. Special problems are outlined, and Dunlap believes that the present methods of psychology are not adequate to attack these problems.

Bentley contributes the last three lectures under the heading "The Psychologies Called 'Structural.'" First he presents an outline of the historical development of the structural viewpoint. In the second lecture he indicates the notable productivity of this viewpoint especially in certain fields, but he points out that it has not covered the entire field of psychology. In the third lecture, he emphasizes the importance of accepting a biological viewpoint to the problems of psychology. Too much emphasis has been laid on the stimulating environment. Bentley would rather have us study the "total state and functional tendency of the entire psychological organism." Special problems from this point of view are discussed.

It is extremely interesting to have a formulation of the different points of view each presented by acknowledged experts in the field, brought together into one volume. The lectures are not written in too technical a style. The reviewer was especially impressed with the emphasis placed on the mind-body and the mechanist-vitalist problems when any of these authorities attempt to formulate their points of view.

SAMUEL W. FERNBERGER

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COLLINS, MARY, & DREVER, JAMES. *Experimental Psychology*. N. Y.: Dutton, 1926. Pp. viii+315.

The book is written at the elementary textbook level with an attempt to present the facts and point of view of psychology from the basis of experimental methods and experimental results. It is frankly and explicitly at a level lower than the other "experimental

psychologies" now extant. Hence the introduction presents a short statement of the psychological methods in general and the subsequent chapters, on special subjects, are concerned with the special methods and the results obtained. From their point of attack, the authors succeed very well, it seems to the reviewer. There is much in the way of emphasis to which the reviewer would disagree, of course. The account of the psychophysical measurement methods, as given in the introduction, seems to be particularly weak. Granted that this is written for the elementary student, it would seem that this material should either be presented in better form or should be eliminated entirely. In the chapter on Cutaneous Sensations the theory of Head is given the place of honor without mention of the critical experimental work which has been done. In the chapter on Perception, the point of view of *Gestalt* is likewise honored without critical comment. As one might expect, in the later chapters on Emotion, Thinking and Language, the experimental basis gets thinner and thinner. A chapter on Mental Testing is included, as well as an appendix on the nervous system.

These criticisms are matters of opinion, of course. The book has merit at the level at which it is frankly written.

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COLLINS, MARY, & DREVER, JAMES. *A First Laboratory Guide in Psychology*. N. Y.: Dutton, 1926. Pp. viii+108.

The book includes, in laboratory note-book form, directions for thirty experiments and for twenty supplementary experiments. These are supplementary to the textbook by the same authors, and follow the same general plan. The topics range from sensory experiments to group tests.

S. W. F.

THALBITZER, S. *Emotion and Insanity*. London: Kegan, Paul; New York: Harcourt, Brace, 1926. Pp. x+127.

Following fairly closely the premises of the Danish philosopher, Hoffding, the author postulates "—three essentially different elements in every psychical process,"—affectivity, intellectual activity, and will. Affectivity is subdivided into mood, feeling, and emotion. Intellect is the active element of sensation and thought, and will is psychomotor innervation.

Built from these elements a somewhat original schematization is offered to cover those clinical syndromes now generally included under manic-depressive psychoses. Eight classes of syndromes are given on the basis of the degree of activity of each element, thus:

<i>Will</i>	<i>Intellect</i>	<i>Affective tone</i>
1. Passive	Unproductive	Melancholia
2. Passive	Productive	Mania
3. Passive	Unproductive	Mania
4. Passive	Productive	Melancholia
5. Active	Unproductive	Melancholia
6. Active	Productive	Mania
7. Active	Unproductive	Mania
8. Active	Productive	Melancholia

The first and sixth groups represent the extremes of manic and depressive psychoses described by Kraepelin. The other groups are briefly compared to mixed clinical types. Subdivisions of these groups are described when one or more psychic element is found to be split, that is, part active and part passive.

Lastly the physiological basis for this classification is outlined on the basis that "Specifically different functions are always fulfilled by specifically different cells." The sensory centers, Broca's area, and the frontal lobes are regarded as the seats of the intellectual element; the ascending frontal convolution as the seat of will, and the occipital lobe, excepting the visual center, as the seat of the affective elements. Lehman's hypothesis that the affective elements are by-products of cells which have other functions as well is denied on the theory that one cell cannot function in two different elemental ways.

Following Carl Lange, Griesinger, and others, and contradicting Verworm, the author accepts the theory that "latent innervation of the brain cells gives rise to a tonus of centers," or the "degree of function" which a center has at any moment. Since all of these centers of intellect, feeling, and will must cover considerable brain area, each may be innervated in part, thus giving rise to simultaneous opposite responses, such as pleasure and displeasure, and infinite number of degrees of these.

In criticism of the book it may be said that little empirical evidence is given or quoted. This might be no serious objection in a work as brief and theoretical as this, if the analysis of behavior

showed careful discrimination. It will probably not occur to many psychologists that will, intellect, and affective tone are functional elements demanding special brain structures. No attempt has been made to seek the relationship between these so-called psychic elements. Much of the recent work of psychoanalysts and students of dynamic psychology seems to indicate marked specific relationships.

While a more careful classification of psychoses would be welcomed, the proposed schematization seems to be a logical fabrication rather than an empirical analysis. Much more detailed accounts must be presented before psychiatrists would be able to use this classification for even a partial description of affective disorders.

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HANBURY HANKIN. *Common Sense and Its Cultivation*. With a Foreword by C. S. Myers. N. Y.: Dutton, 1926. Pp. ix+289.

This is an interesting and curious book, somewhat after the manner of Galton's "Inquiry Into Human Faculty." It has the same faults and many of the same merits. The author seems to be, like Galton, a man of encyclopedic interest and of considerable erudition.

His thesis may be briefly stated. Common sense or "intuition" is contrasted with the pedestrian logical type of constructive imagination and reasoned judgment. That both are important goes without saying. But whereas the majority of men, especially the leaders in industry, statecraft, or business, need common sense far more than reasoning, our educational processes are directed almost exclusively to the cultivation of reasoning and the kind of conscious memory which serves it. So far Dr. Hankin's thesis will meet ready acceptance, and educational policies ranging from the Montessori system for the kindergarten to the Cincinnati and Antioch plans for the college have in part been predicated on the need for supplementing a too bookish type of education for life. But Hankin goes on to urge that the cultivation of reasoning is antagonistic to the development of common sense. Common sense or intuition requires for its development the enrichment of the subconscious mind through experiences which become effective for intuition in almost direct proportion as they are unavailable for conscious recollection and reasoning—i.e., in proportion as the experiences are "forgotten."

Unlike most dabblers with the subconscious, Hankin does not

noticeably mangle his terminology. Despite the fact that the subconscious is essentially a negative concept, a cover for our ignorance, he does not make of it a mystic entity capable of unimaginable wonders. The unconscious consciousness of the psychoanalysts is entirely absent. Indeed he is in marked opposition to both the anti-intellectualism and the pan-sexualism of Freudism. "The extreme followers of Freud," he says, "mistaking the misfortunes of the subconscious mind for its functions, think that nothing is worth noticing unless it can be brought into relation with affairs of sex" (p. 2). "If an emotion is normally repressed it has to stay repressed if one is to retain one's mental equilibrium. Excessive contemplation of the relations of the sexes is unpleasant to the normally constituted mind. If the implied repression is removed there is a liability for the emotions connected with sex to 'take charge,' as the sailors say, and lead to a frame of mind in which nothing is thought to be explained or worth explaining unless it can be brought into relation with sex instincts" (p. 3f.). That this is an argument which can cut both ways does not detract from its obvious sanity of outlook.

For Hankin, in any case, the subconscious mind is chiefly an organ of intuitive judgment rather than of affection and conation. To show how it operates, he piles up a variety of examples from the most diverse fields: lightning calculations, musical composition, the verdicts of juries, globe trotting, swindling and confidence tricks, business in general, and prejudicial thinking and rationalization. (Probably it is too late to rescue a perfectly good word like rationalizing; but the reviewer is inclined to think that psychologists might make the attempt by adopting Hankin's excellent suggestion of "alexie thinking"—from the Greek, *alexiein*, to protect or fend off. Or better yet, we might use *alexiteric*, a word already coined, which avoids confusion with *a-lexia*. If the suggested term fails of the popular vogue of rationalizing, that would not be wholly loss.)

In the cases cited of subconscious judgment, Dr. Hankin is perhaps not entirely free from the charge of *post hoc ergo*. Yet in proportion to the number and variety of his instances does the charge lose effect. At least he established a presumption in favor of his theory. If negative cases are unemphasized, after all he but illustrates his own dictum: "Though our reason may sometimes tell us that we are influenced by a preconceived idea, we have no monitor capable of telling us when we are free of them" (p. 181). The psychologist will find in this book an interesting and useful collection of intuition.

The application of all this to education forms a strange contrast to the evident sanity of the discussion as a whole. It sounds like some satire on traditional education. The value of classical training consists in the fact that the classics are dull and are inevitably forgotten almost instantly. They derive their value, not because their difficulty trains one's reasoning, but because they do not. Their sole value, and their sufficient justification as the backbone of education, lies in the way in which they train boys rapidly to forget what they have learned. The sciences can be made interesting enough to boys so that they will remember them. Now whenever we can remember anything, we inevitably use it in conscious reasoning—a useful process for the scientist or expert, but dangerous for the business man. The chief aim of education may be said to be the training of one's "forgettery."

All of this in deadly earnest. Yet of all strange faculties of the mind, the faculty of forgetting is surely the strangest to be trained. A work of supererogation, surely. And quite a relief to teachers, too, to be told that their success is to be measured by the amount that their pupils forget. But the subconscious mind, on Hankin's own theory, must operate upon data, albeit "forgotten" data. How a person is to get the experiential data when education is limited to the useless, irrelevant and uninteresting, as Hankin proposes, does not appear.

Yet the book does give one to think. First, how pathetically little psychology has to say about "intuitional judgment" though it is an undoubted fact and of the highest importance. And then perhaps as a correlate, how little we do do in our current educational enterprises towards training and developing this exceedingly valuable type of response. Hankin has shown us a number of places where the phenomenon stands out clearly as such; will not some psychologist undertake to make clear its fundamental nature?

HORACE B. ENGLISH

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LAIRD, J. *Our Minds and Their Bodies*. N. Y.: Oxford University Press, American Branch, 1925. Pp. 122.

The first or descriptive portion of this little book by the Regius Professor of Moral Philosophy in the University of Aberdeen presents what in the author's opinion is the dualistic and interactionistic position assumed by the "common sense" of "plain people" upon

the body-mind question. In this discussion polite reference is not lacking to the notions of primitive men and to the teachings of the ancient philosophers. The second descriptive chapter considers the evidence of science upon the psychophysical question. The undoubted monistic tendency of much modern psychology and physiology is recognized. Activism; behaviorism; McDougall's theory of instinct; the contributions of Freud, Janet, and Pavlov; Head and Rivers' epicritic and protopathic theory; Lombroso's criminal type theory; Sherrington's conception of the nervous system; and the cortical localization controversy, are all given at least cursory consideration in so far as they bear upon the central thesis of the book.

The hypotheses concerning the *connection* between mind and body are next presented. If the two-fold nature of the mental and bodily series is admitted, all theories of their relation, it is held, must fall under one of the three following heads: mind depends on body; body depends on mind; or, mind and body are independent (p. 59). The argument for the interaction of mind and body is ably presented. This defense is the more pellucid because the always absurd "telegram argument" (Cf. McDougall, W., *Body and Mind*, 1911, p. 268) and the invalid argument from the supposed biological utility of "interaction" are both abandoned. The retained arguments, particularly that from "common sense," are still, of course, open to objection.

The remaining portion of the book is frankly, rather than covertly, metaphysical. Here, "the broader cosmical aspects of the *de facto* connexion between body and mind" are considered (p. 58). The author admits that this section of his work transcends the "brutally empirical." The following metaphysical positions are considered: materialism, mechanism, neutral monism, mind energy, idealism (in various aspects), parallelism, and finally philosophical dualism. In conclusion appears what may be termed a *plea for belief* in "effective interaction, and not correspondence, between spirit and living process" (p. 115).

In this volume, therefore, an able metaphysician, not unacquainted with certain aspects of scientific thought, has presented, in an interesting rhetorical style, some opinions on one of the perennial problems of his cult. After referring to Aristotle's belief that the heart performs the functions of the brain, the author asks: "Does any one suppose that if the Stagirite's physiology had been improved that his system of logic would have been better or his ethics

improved in consequence?" Yes: there are those who so believe. Such optimistic believers, however, are in general too much concerned with the experimental study of the multiform reactions of the human organism to write essays under what must seem to them the quite anomalous title of *Our Minds and Their Bodies*."

LEONARD CARMICHAEL

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PORTEUS, S. D., and BABCOCK, M. E. *Temperament and Race*. Boston: Badger, 1926. Pp. xiv+364.

The authors have made good use of their opportunities in Hawaii to study the racial traits of the several different races that are well represented on the islands. They have given many different tests. The reviewer does not know of any other study in which Chinese and Japanese children have been as adequately measured and compared as in this study. In addition Hawaiians, Filipinos and Portuguese are included. The plan of the book is ambitious. Not only do the authors attempt to give and interpret intelligence tests, but they also have made many head measurements, given tests for foresight and made social ratings.

The book begins with a very interesting historical survey of the five chief races in Hawaii to-day, namely, the Hawaiians, the Chinese, the Japanese, the Portuguese, and the Filipinos. A social rating scale is then discussed, a scale based upon previous work of Porteus with mental defectives. Twenty-five people "of long experience in the islands" rated the several races by means of this scale. The seven traits of the scale with appropriate weightings are then used to derive a racial efficiency index. The ranking of the various races in efficiency is as follows: Japanese, Chinese, Portuguese, Hawaiian, Filipino and Porto Rican. Just how reliable or valid such a racial index is, it is difficult to say. It would seem to be nothing but an average opinion of these races from the Anglo-Saxon point of view. At any rate, the procedure is an interesting attempt to extend the rating scale for individuals to the rating of groups. There then follows a brief survey of the social adjustments of the several races as indicated by criminal statistics, scholarship, mental retardation and occupation.

Another line of attack is now made in the direction of head measurements for the estimation of brain capacity. The rank order for three races is Anglo-Saxons, Japanese, Chinese. The authors

believe that brain capacity is more significant for social development than for intelligence. They further believe that there is a marked difference in brain capacity between males and females, so much so indeed that the curve on page 159 would seem to mean, as far as the reviewer can interpret it, that females at the age of twenty-five only possess the brain capacity of males of the age of thirteen, and that this brain capacity is only slightly above that possessed by Australian Aborigines and is below that possessed by 48 defectives.

Next follows a general discussion of intelligence testing and the army results, somewhat too lengthy for such a book. This is a prelude to the results of the Binet testing. Of course, the Binet is not a suitable test for racial comparisons, hence a modified Binet must be used. Why not use non-verbal tests instead of all this juggling with the Binet? At any rate the Chinese lead with an average I. Q. of 87, followed by the Japanese with 85. In form and assembling tests the Hawaiians lead all races, even the Americans. In group intelligence tests of a verbal type the Chinese lead again, after the Americans. The Porteus Maze tests are given as tests of planning and foresight, and here the Japanese lead all races, even the Americans.

All these test results are interpreted by the authors, and upon them they build a very interesting picture of racial differences in temperament and intelligence. The book closes with very definite opinions about racial differences, the coming struggle for dominance in the Pacific and the great need for character education in our schools.

R. PINTNER

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Boody, B. M. *A Psychological Study of Immigrant Children at Ellis Island*. Mental Measurement Monographs. Serial No. 3. Baltimore: Williams & Wilkins, 1926. Pp. 163.

To the reviewer this book proved very exasperating, because the promise aroused by the title failed to materialize. Only a little more than one-quarter of the book deals with the author's own psychological testing at Ellis Island. It is, however, a poor review that blames the author for what has not been done. Let us, therefore, indicate the nature of the work.

The first five chapters, the major portion of the book, deal with the immigration problem in general, the laws of immigration and

their administration, the actual procedure at Ellis Island and a review of previous psychological work with immigrants. All of this is excellently done. We are reminded that the problem of immigration is an old one, that from 1819 on there has been constant fear in this country that the immigrant would overwhelm the nation and distort its ideals. The author gives a clear account of the recent radical changes in our immigration laws, with particular emphasis upon the effect these have had upon the problems of exclusion for mental defect. She shows clearly how the lessening stream of immigration has allowed time for more thorough examination. The statistics of examination and deportation show the gradual increase in emphasis upon the problems of mental defect and mental deficiency. The review of previous work on testing shows clearly the increase in the use of mental tests proper. A detailed and interesting account of the actual procedure of handling the immigrant at Ellis Island shows the difficulties which stand in the way of thorough and routine intelligence testing. Whether all immigrants could be given a test is discussed. To make a thorough test possible would undoubtedly necessitate considerable change in the present procedure.

The testing which the author herself did was of necessity restricted to those children who voluntarily attend the school at Ellis Island. Between 200 and 300 children were given one or more tests. The work is purely tentative and must be considered an attempt to find out whether certain tests might be feasible for use with such children. The younger children were given a few of the Binet and Woolley tests. The older children were given some nonverbal tests, both individual and group. Unfortunately none of the tests chosen were among the several nonlanguage tests now available, which have adequate norms based upon American children. This idea of comparison with American norms seems to have been in the author's mind, because some attempt is made to compare the immigrant children's performance on the Army Beta with three small groups of children tested on this test. But the groups are totally inadequate for any such comparison. It is absolutely impossible to say whether the groups tested are better, the same or worse than American groups, because there are no adequate American groups available. Furthermore, the numbers of each race tested are few. The largest number of any one race seems to be 37 for German and 37 for Armenian children on the Beta Test. Only five nationalities are represented by more than 20 members. Twenty-four nationalities have fewer than 20 representatives, and of these 14 nationalities

have only 2 or 1 representative each. In view of this scattering of nationalities, not to mention the wide scattering of ages within each national group, it seems to the reviewer impossible to conclude, as the author does in her summary, that "the curve of the scores seems not to differ in any marked degree from race to race, nor does it differ markedly, with possibly a slight allowance for differences in the strain of examination conditions, from the curves shown in studies of unselected groups of American children."

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